National Defense Center for Energy and Environment

Hawai'i Undersea Military Munitions Assessment (HUMMA) Update

Erika Brandenburg, NDCEE/*CTC*

Sonia Garcia, Environet, Inc.

DoD Executive Agent

Office of the Assistant Secretary of the Army (Installations and Environment)

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Key Personnel

- U.S. Army
  - Mr. Tad Davis – Deputy Assistant Secretary of the Army for Environment, Safety and Occupational Health (DASA (ESOH))
  - Mr. J.C. King – Assistant for Munitions and Chemical Matters, Office of the DASA (ESOH)
  - Mr. Hudson Kekaula – U.S. Army Corps of Engineers, Pacific Ocean Division, Honolulu, Hawaii
- Prime Contractor – Concurrent Technologies Corporation

  Ms. Erika Brandenburg
- Subcontractor – University of Hawai'i at Manoa

  Principle Investigator – Dr. Margo Edwards
- Subcontractor (Technical Approach, Sampling) – Environet, Inc.

  Senior Project Manager - Ms. Sonia Garcia

Introduction

- Between 1919 and 1970, the Armed Forces disposed of excess, obsolete, or unserviceable munitions in coastal waters off the United States, including Oahu, Hawaii.
- In 1970, the DoD prohibited sea disposal of munitions.
- In 1972, Congress passed the Marine Protection, Research, and Sanctuaries Act, Public Law 92-532, prohibiting the disposal of wastes, including munitions, in ocean waters.
- DoD is conducting research to identify the locations of sea-disposal sites and the types of munitions sea disposed at each site and evaluating the potential impact of sea disposed munitions on human health and the environment.

HUMMA's Objectives

- Develop efficient and cost effective methodologies for characterizing munitions sea disposal sites.
- Characterize Site Hawaii-05 (HI-05) -- a munitions disposal site approximately 5 miles south of Pearl Harbor that was suspected to contain conventional munitions and chemical warfare material (CWM) (chemical munitions and bulk chemical agent).
- Conduct sampling required to determine the impact of sea disposed munitions on human health and the environment, as well as the effect of the ocean on the degradation of the munitions.

HUMMA Study Questions

- Can video tows distinguish between natural bottom features and munitions?
- Can Towed Video Array (TVA), Remotely Operated Vehicles (ROV), and Human Operated Vehicles (HOV) distinguish the range of integrity of the munitions at randomly selected study sites?
- Can munitions constituents be identified (if present) in sediment, seawater, and human food biota when using conventionally available methods of analysis?
- Can munitions constituents be detected at levels significantly different than those in a control site with no munitions?
- Are there differences in quantity or type of ecological and/or sentinel species between a munitions disposal site and a control site?
- Can munitions constituents pose a risk to human health at the levels found?

Challenges of Study

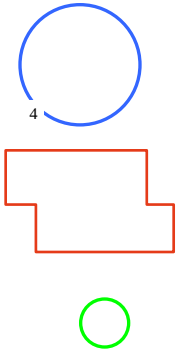
- The water depth of HI-05 (1,500 +/- feet)
- Limited bottom time
- Uncertainty about bio-concentration and bio-magnification of munitions constituents and degradation products
- Lack of knowledge about the specific types of munitions and their condition (e.g., breached, intact)
- Lack of biota used for human food
- Prevalence of transient and pelagic biota

Strategy

- Locate sea disposed munitions (considered discarded military munitions (DMM))
  - Review archival research
  - Map the suspect disposal site – conduct sonar survey
  - Conduct video tows to help determine dive sites
  - Conduct dives (submersible and ROV) to verify sonar data operations
- Collect and analyze water column, sediment, and biota (fish and infauna) samples at the disposal site and controlled areas
- Evaluate risk
- Conduct community relations and educational outreach

Study Area (HI-05)

- 26.6 mile^2 Study Area, located 5 miles (+/-) south of Pearl Harbor, with a depth of 900 – 1600 feet



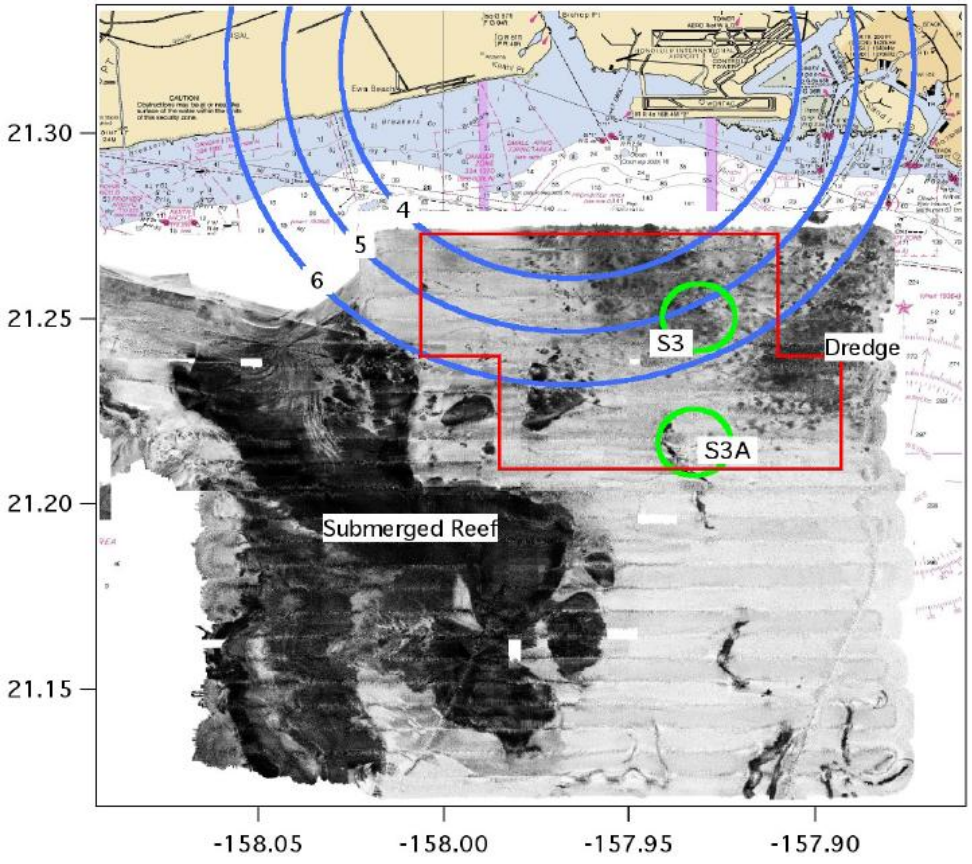
= Distance in miles from the mouth of Pearl Harbor

= 26.6 mile^2 HUMMA Project Study area

= Areas investigated during the USACE dredge material surveys conducted in 1976

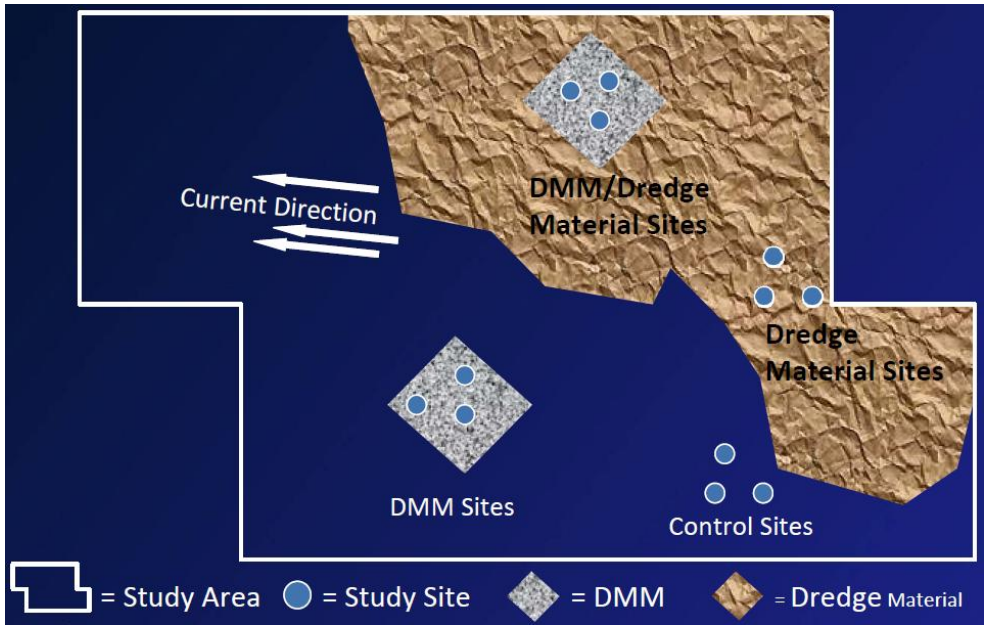
The darkest material in the image is the submerged reef and the dredge material is the intermediate grey as indicated.

Source: UH, 2007



Sampling Sites

- Number: 19 sites (984 ft diameter) within the Study Area
- Samples taken at:
  - Breached and intact DMM (including suspect CWM)
  - Breached and intact DMM in dredge material disposal areas
  - Dredge material disposal areas
  - Control sites (neither DMM nor dredge materials present)



Simplified Study Area Schematic

Sampling and Analysis Plan

- Field Sampling Plan
  - Acquisition of remotely sensed (non-contact) data
  - Field activities
  - Field documentation
  - Sample packaging and handling
  - Disposal of investigation derived waste
- Quality Assurance Project Plan
  - Data generation and acquisition
  - Assessment and oversight
  - Data validation and usability
- Health and Safety Plan
  - Medical surveillance and training
  - Site hazard characterization and activity hazard analysis
  - Personnel decontamination requirements
  - Accident prevention and emergency response

Chemical Constituents

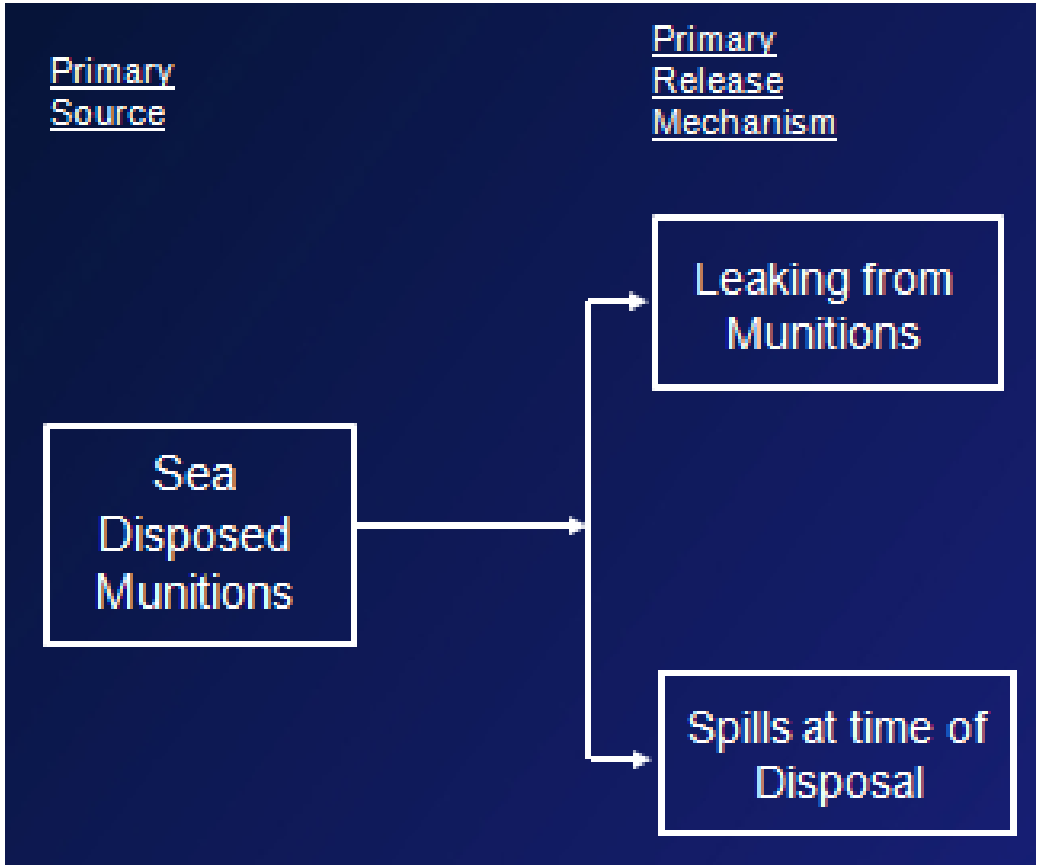
Chemical Agents / Degradation Products
Mustard
1,4 dithiane
1,4-thioxane
Thiodiglycol (TDG)
Dichloro(2-chlorovinyl)arsine (Lewisite)
2-chlorovinyl arsenous acid (CVAA)
2-chlorovinyl arsenous oxide (CVAO)

Energetics/Degradation Products
2,4,6–trinitrotoluene (TNT)
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)
4-amino -2,6-dinitrotoluene (4-Am-DNT)
2-amino -4,6-dinitrotoluene (2-Am-DNT)
Hexahydro-1,3,5 -trinitro-1,3,5-triazine (RDX)
Metals
Arsenic (total)
Copper
Lead

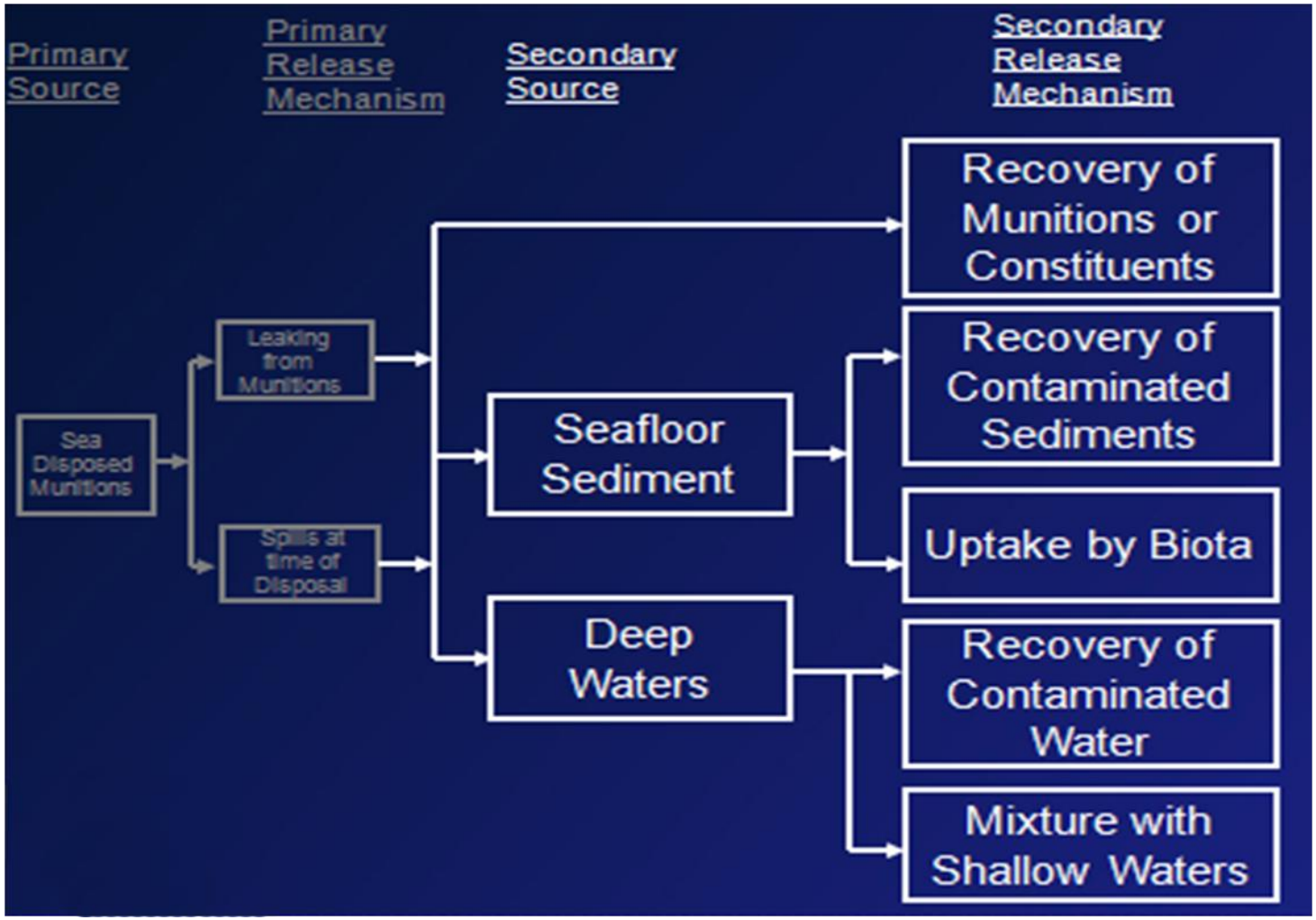
Task Progress

- August, 2007 – Conducted SONAR survey of HI-05
  - Purpose – Map the study area with 200% overlapping coverage to look for small-scale reflective features
  - Results – Tens of thousands of small reflective features were located, including long linear trails and fields that potentially contained DMMs
- December 2008 – March 2009 (video tows started 12/2008)
  - Conducted video tows
  - Conducted dives (submersible and ROV) based on evaluation of SONAR data and selection of potential targets
  - Collected water and sediment samples in the vicinity of the selected munitions, dredge, and at control sites
- April 2009 - June 2010 – Biota sampling and chemical analysis to assess potential impact on human health and the environment, preparation of final report.

Conceptual Model



Conceptual Site Model



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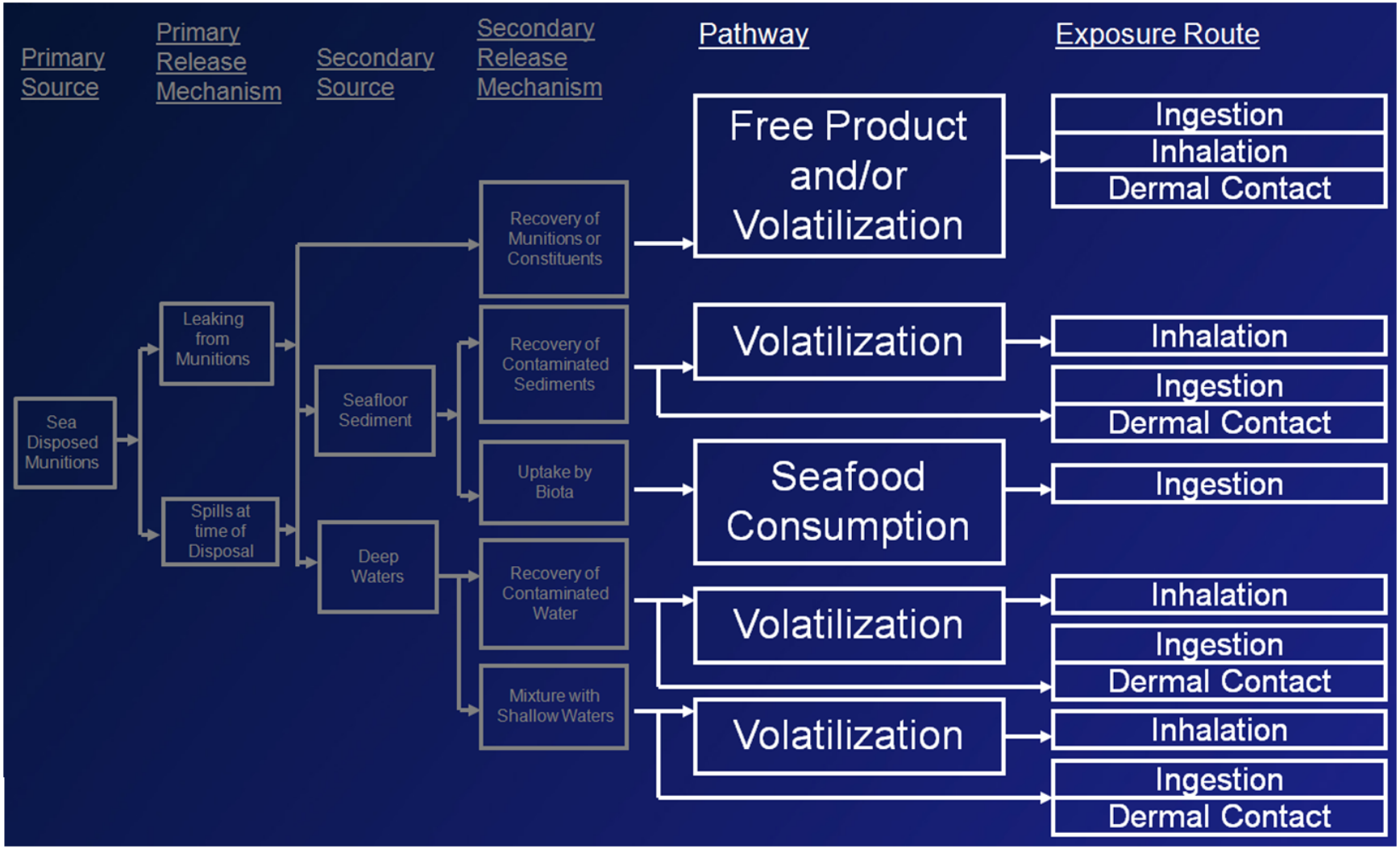

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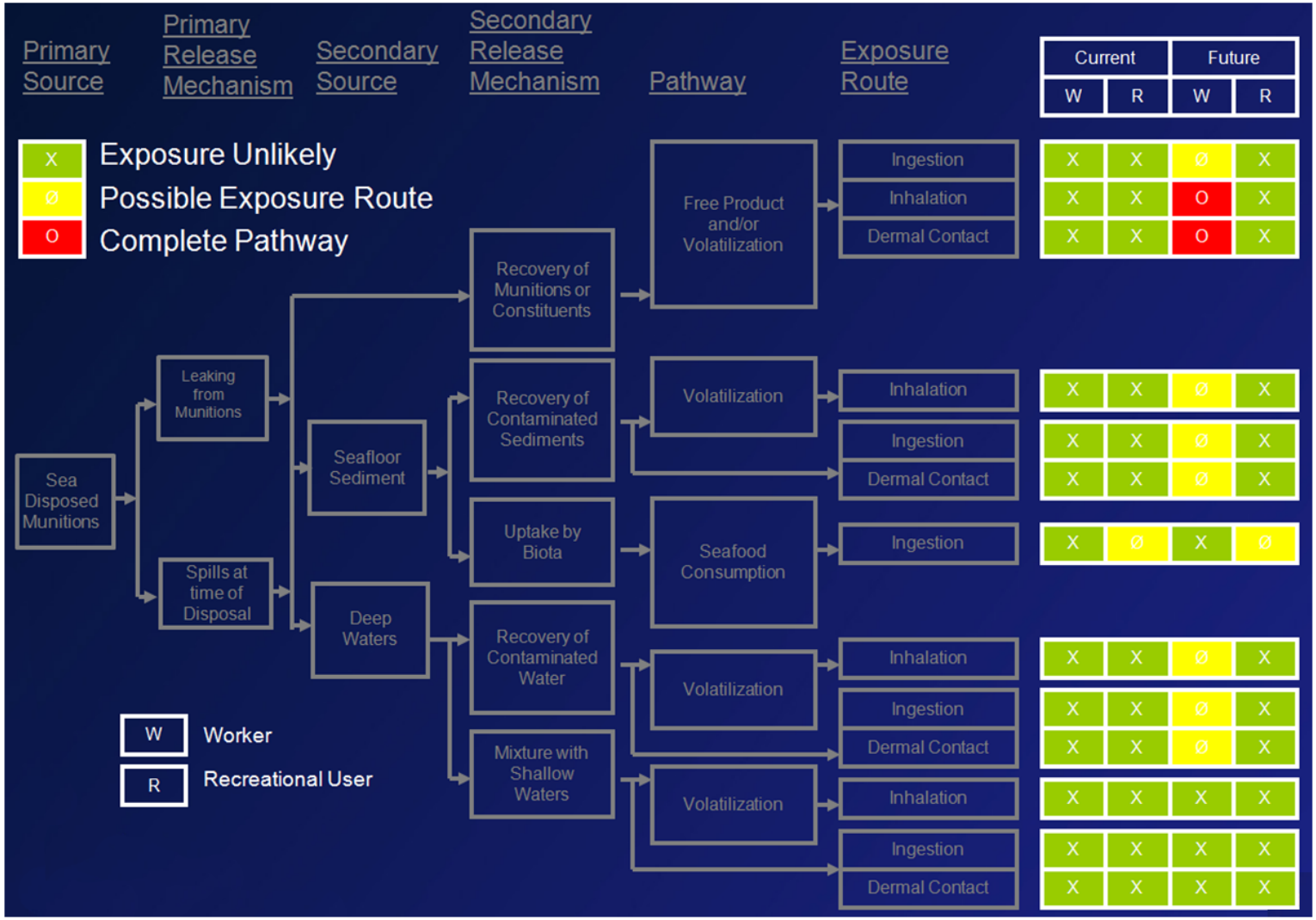


Public Involvement Plan

- Because HUMMA was a high profile effort, a communication plan was created to lay out the components of the public involvement program and to identify how the public would be engaged.

- Public Involvement Plan included:
  - Naming primary spokespersons
  - Creating communication guidelines
  - Establishing the outreach efforts (formal and informal briefings, website (www.HUMMAproject.com), press releases, and printed materials)
  - Identifying the primary audiences
    - Elected Officials
    - State Agencies
    - Community Groups
    - Army Liaisons in Hawaii
    - Key Individuals
    - Media

Lessons Learned from Diving Operations "Successes"

- Many of the lines and fields of "speckles" observed in the backscatter data correspond to trails of DMM on the seafloor.
- The ROV is a useful nighttime tool for evaluating debris trails for potential munitions prior to landing on them.
- Currents were too strong for the ROVs to travel along the "straight" line of the speckled paths. Therefore, the operators found it more efficient to "slalom" crossing the speckled path on occasion to locate features.
- Submersibles can acquire samples close to targets.
- Sediment scoops and water samples deployed by the submersibles were effective in collecting intact, discrete samples.
- On-board contingent can screen samples for chemical agents before taking custody to protect human health.
- Submersibles can return to the same DMM after several days (dives).

Lessons Learned from Diving Operations "Difficulties Encountered"

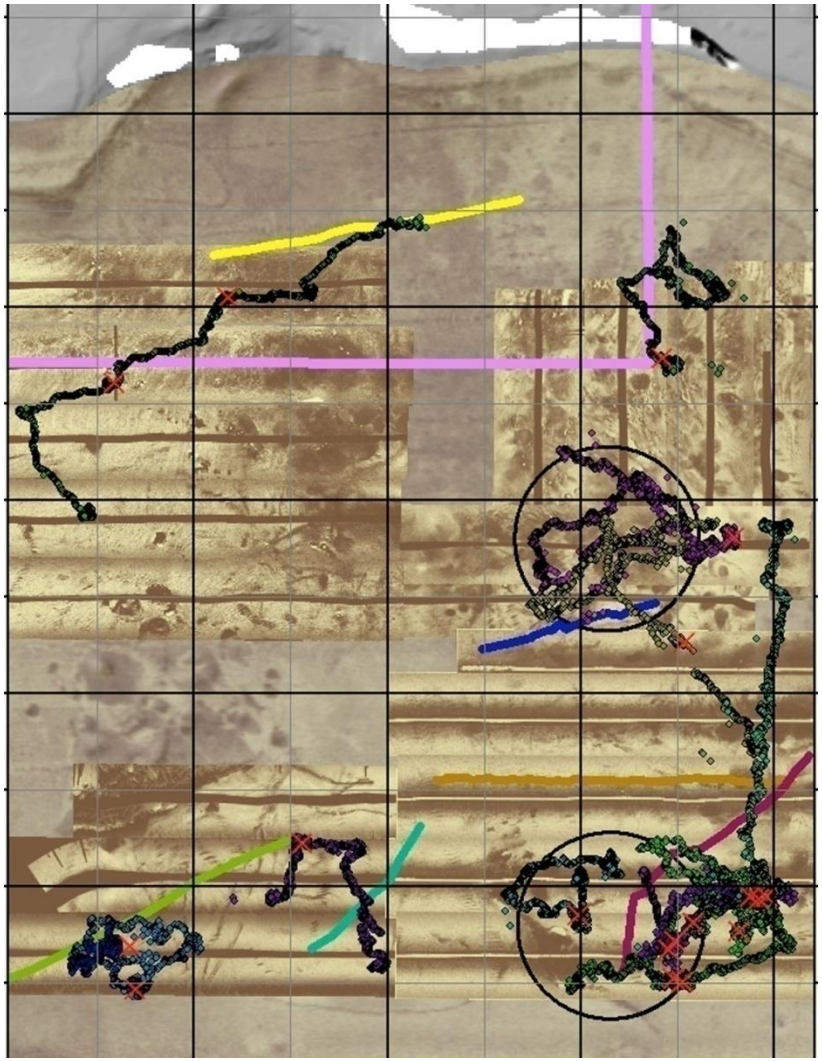
- Stratigraphic preservation of infauna samples collected during the submersible dives was poor because the muddy/sandy substrate was very fluid.
- Sample weight and corresponding basket space are a limiting factor for the submersibles.
- Sample sites were to be selected based on the condition of the DMM objects, both intact and breached. Without touching the ordnance, it was difficult to determine if it was breached. Therefore sample areas were changed to DMM objects in clean areas and DMM objects in dredge spoil disposal areas.
- To avoid reducing the time allotted for submersible dives, a commercial fisherman collected the macrobiota samples after the primary field program.

Map of Diving Operations

- 16 submersible dives
- 6 tows of the ROV

Figure Description

- Submersible (circled points)
- ROV (line)
- Large black circles indicate disposal sites Area 3 (north) and Area 3A (south) where U.S. Army archival research suggested DMM might be located
- Thick pink lines indicate the southeastern extent of the Defensive Sea Area

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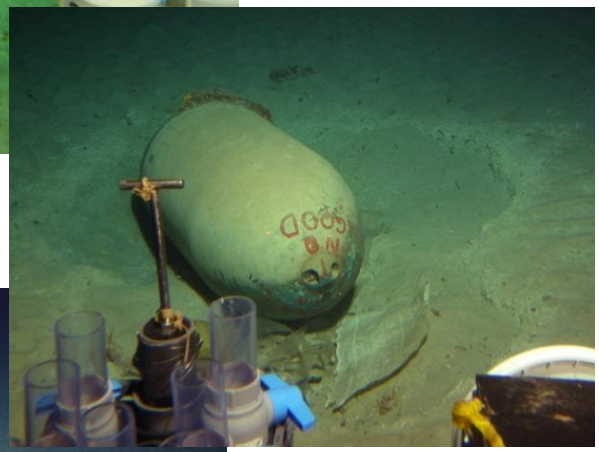

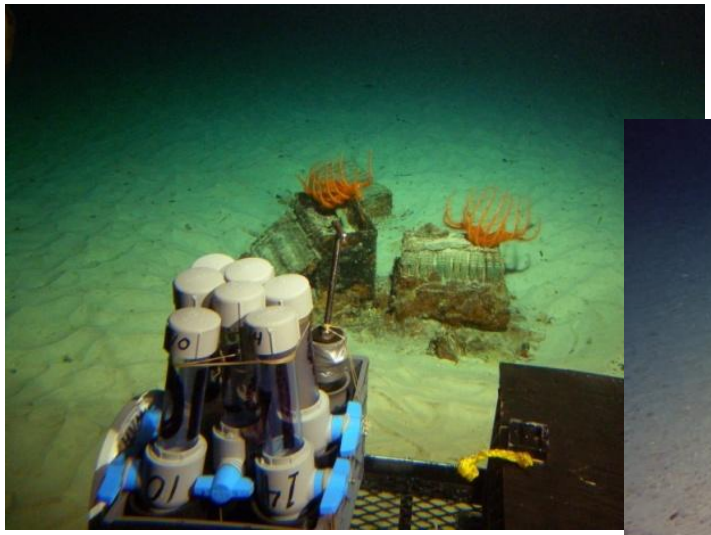

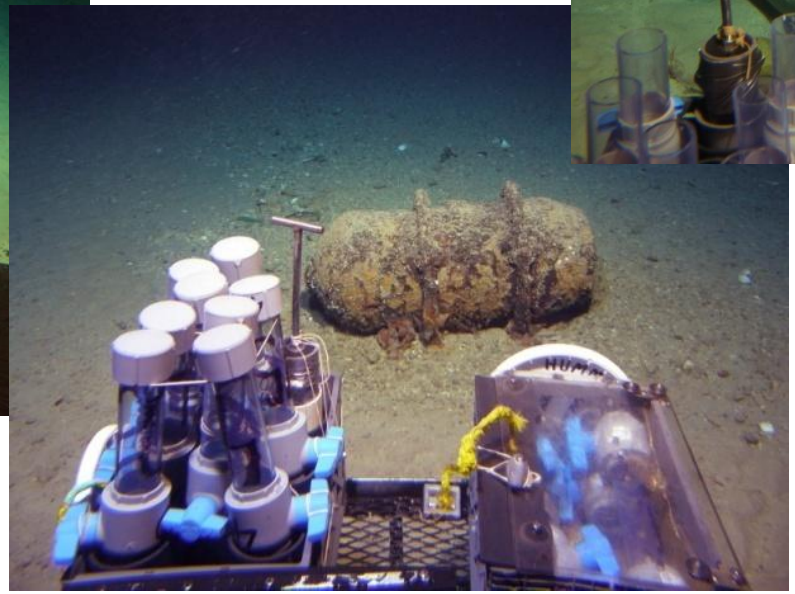

National Defense Center for Energy and Environment

Points of Contact

Ms. Erika Brandenburg

Concurrent Technologies Corporation

904-486-4008

BrandenE@ctc.com

For more information:
www.HUMMAproject.com

DoD Executive Agent

Office of the Assistant Secretary of the Army (Installations and Environment)

www.ndcee.ctc.com

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